INTEGRATED DESIGN SYSTEMS - CAPTURING , REUSING AND OPTIMIZING DESIGN METHODS IN NEW MILLENNIUM

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ABSTRACT

An important goal of Ncw Millennium is to research new methods of performing spacecraft and mission design. We have completed the first phase of our effort on how to make design tools such as analysis programs more available. We arc now embarking with Stanford University on discovering methods to allow more project history and knowledge to be automatically captured and reused and with Ames Research Center on how to usc virtual reality to enhance the visualization of ncw missions before any hardware exists. We arc also trying to capture the design process in an electronic form so that computer aided optimization may lead to a vastly greater search of the possible designs which meet the design requirements.

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The first generation of microspacecraft is already in design but wc will be introducing our new design tools in time for the second generation. There arc several features that wc wish to bc able to offer such designers besides the availability of captured design knowledge.

- Seamlessly connectable analysis tool set
- Simulated immersive mission validation
- Immediate access to written material germane to past decisions

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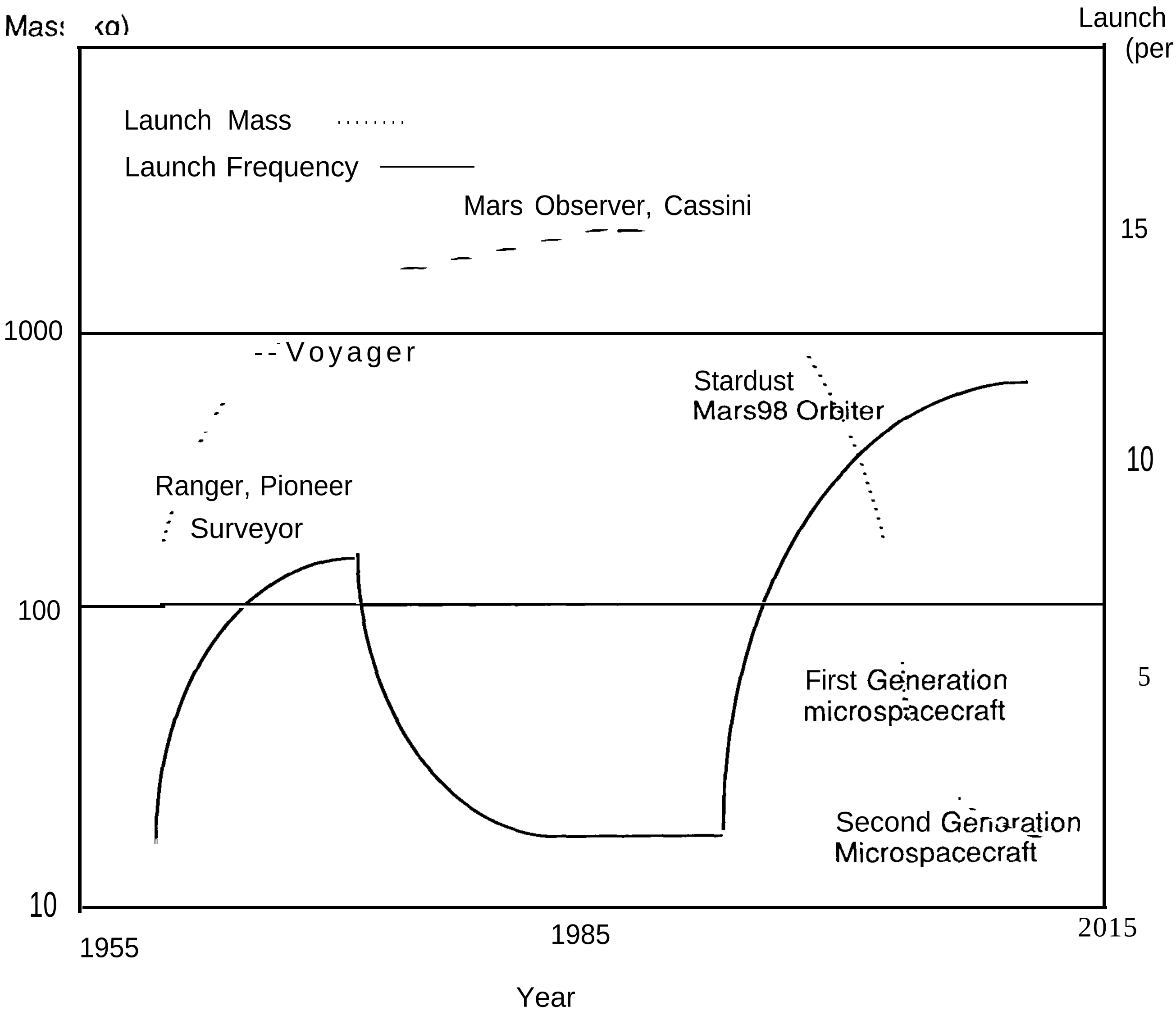

Fig. 1: Proposed JPL Launch Schedule

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in 1993, wc began a collaboration with Lockheed Martin Corp. to produce a design environment where it was easy to integrate new design tools (for example, analysis programs) and to describe the data flow through collections of these tools so as to produce results to aid in the decision making. This environment, called the Multidisciplinary Integrated Design Assistant For Systems (MIDAS) has been in usc now for several years at JPL with notable success.

Building on this base wc arc now working on two separate areas of Integrated Design Systems. One is a collaboration with Stanford University to allow the automatic capture of design history as it occurs and allow for the recovery of the history when requested by later designers. The other is to add a immersive design system (Interpretive Product Design Environment, IPDE) which will allow designers to examine and test their designs before any hardware exists. A key part of the IPDE is to connect it directly to the MIDAS system so that the full tool set is available from within the IPDE. Recently wc have teamed with Ames Research Center to take advantage of their knowledge of immersive design.

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Integrated Design Systems requires the best design tools for spacecraft and missions. Whenever possible wc usc start-of-the-art tools but sometimes can only find best-practice tools. Certain of these technologies arc available commercially, and the spacecraft industry is using them to some degree. Other tools arc "home-grown" and still others arc in development, such as probabilistic analysis methods.

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(3) Projects including
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(4) Methograms including
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- Subcomponents
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(5) Interpretation tools including
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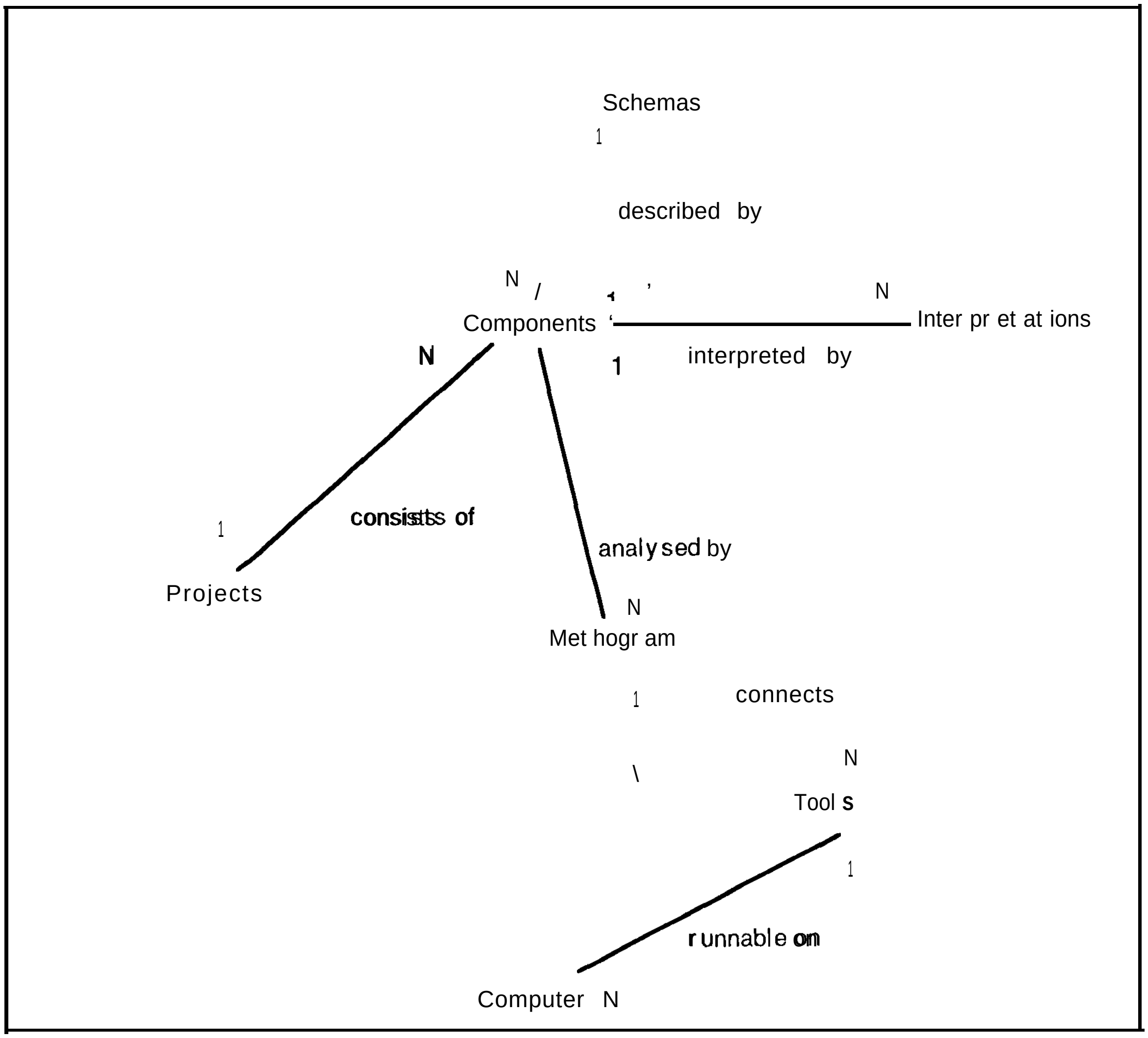

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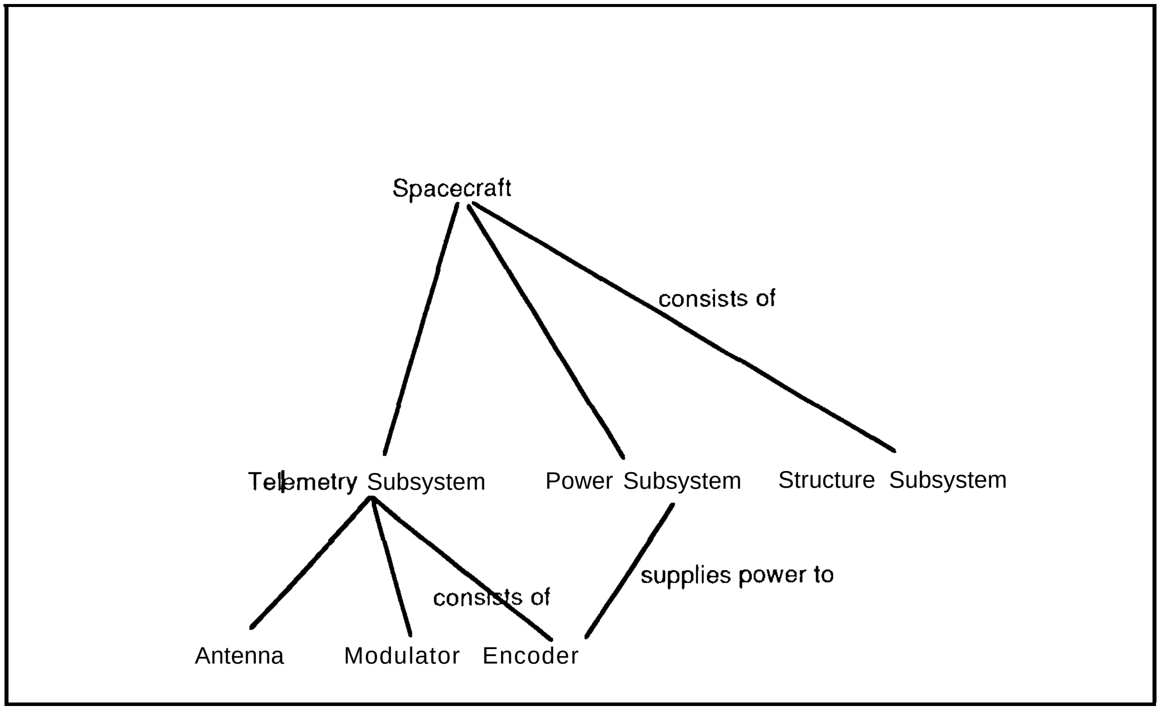

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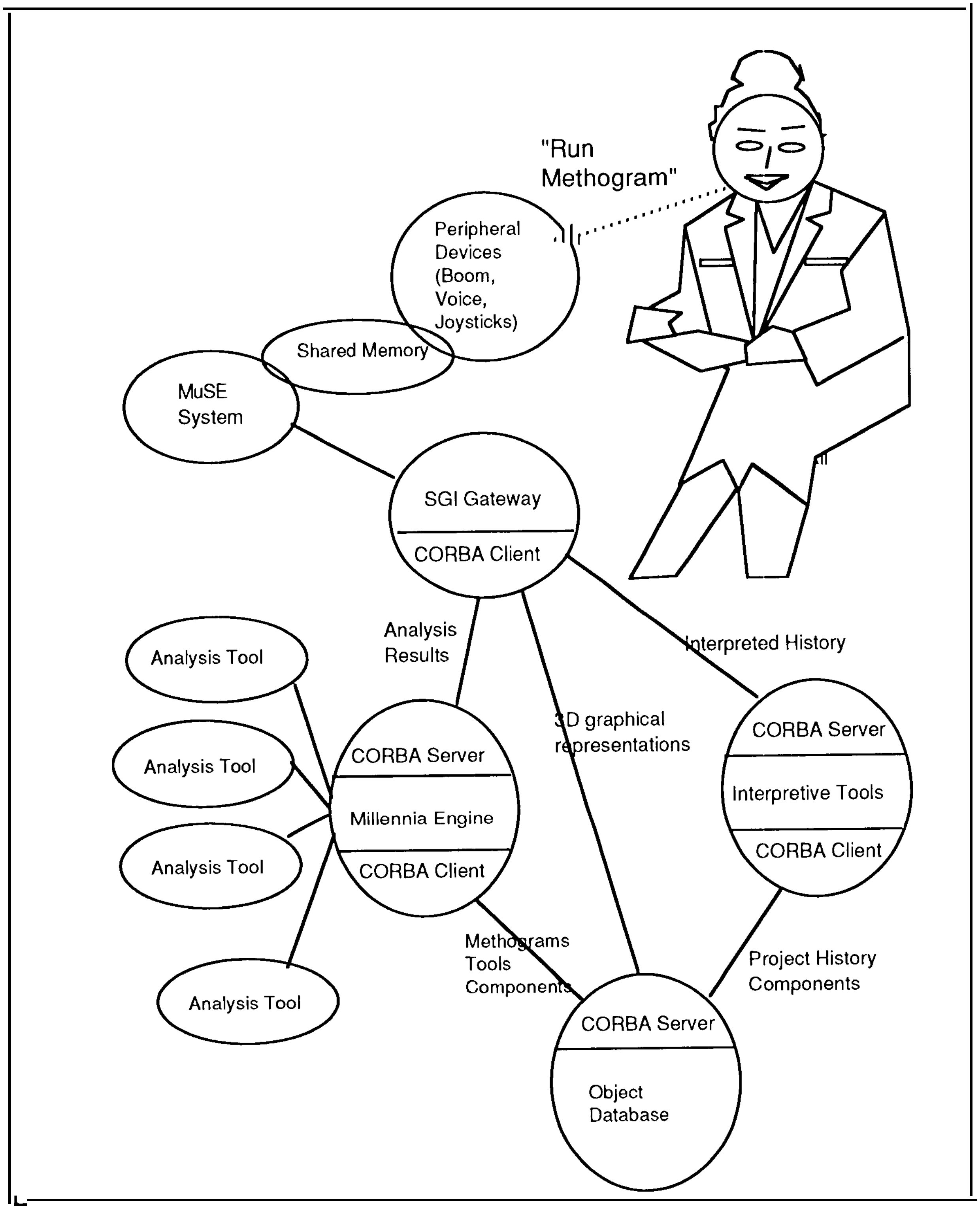

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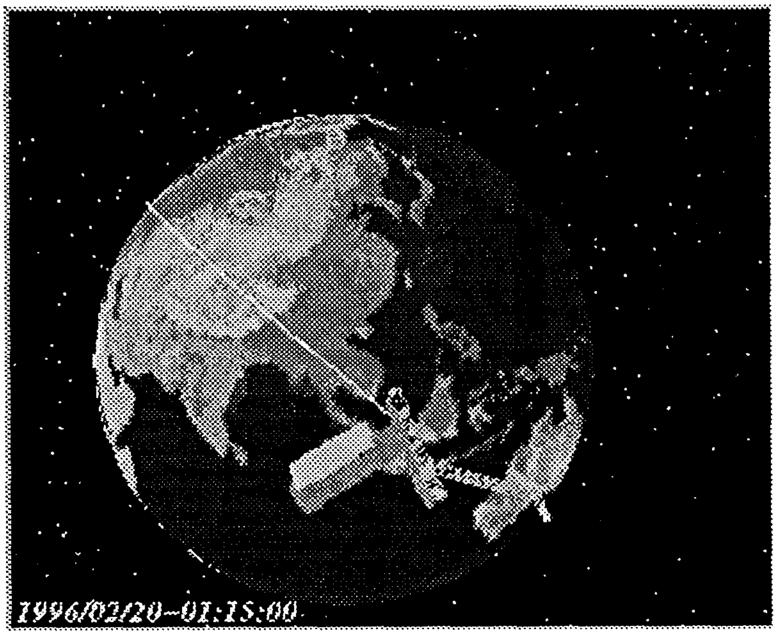

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A design scenario for the year 2000 might consist of a spacecraft designer sitting at a control boom and looking at the scene shown in Fig. 6 which consists of a SIM spacecraft in orbit around the Earth. With a voice command, the designer can stop time and point the spacecraft to the star that it is observing. The designer can then request that a calculation of the light path through the optical system be pcrformcd using the JPL I-MOS software. The results would return in the form of twin light paths becoming visible on the spacecraft image. The designer could then say "Rcmovc panel A" and this would be done showing the light path interior to the spacecraft. They could then make some modification to a mirror position and redo the calculation all with voice command. Then it would be possible to ask Jack why the mirror position was so close to the telemetry and Jack will search the data base and reply verbally by repeating the conversions that were exchanged on the subject in 1998.

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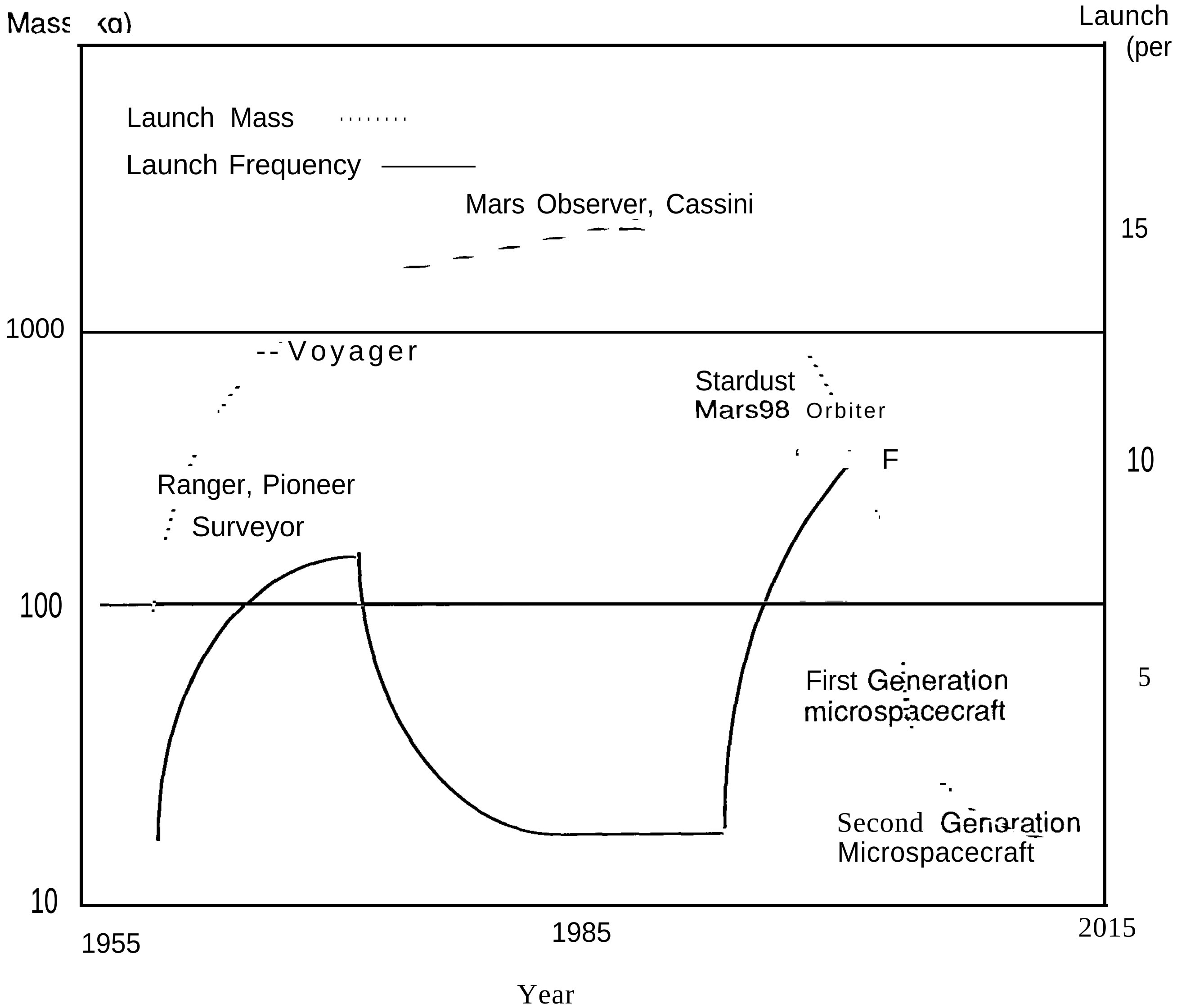

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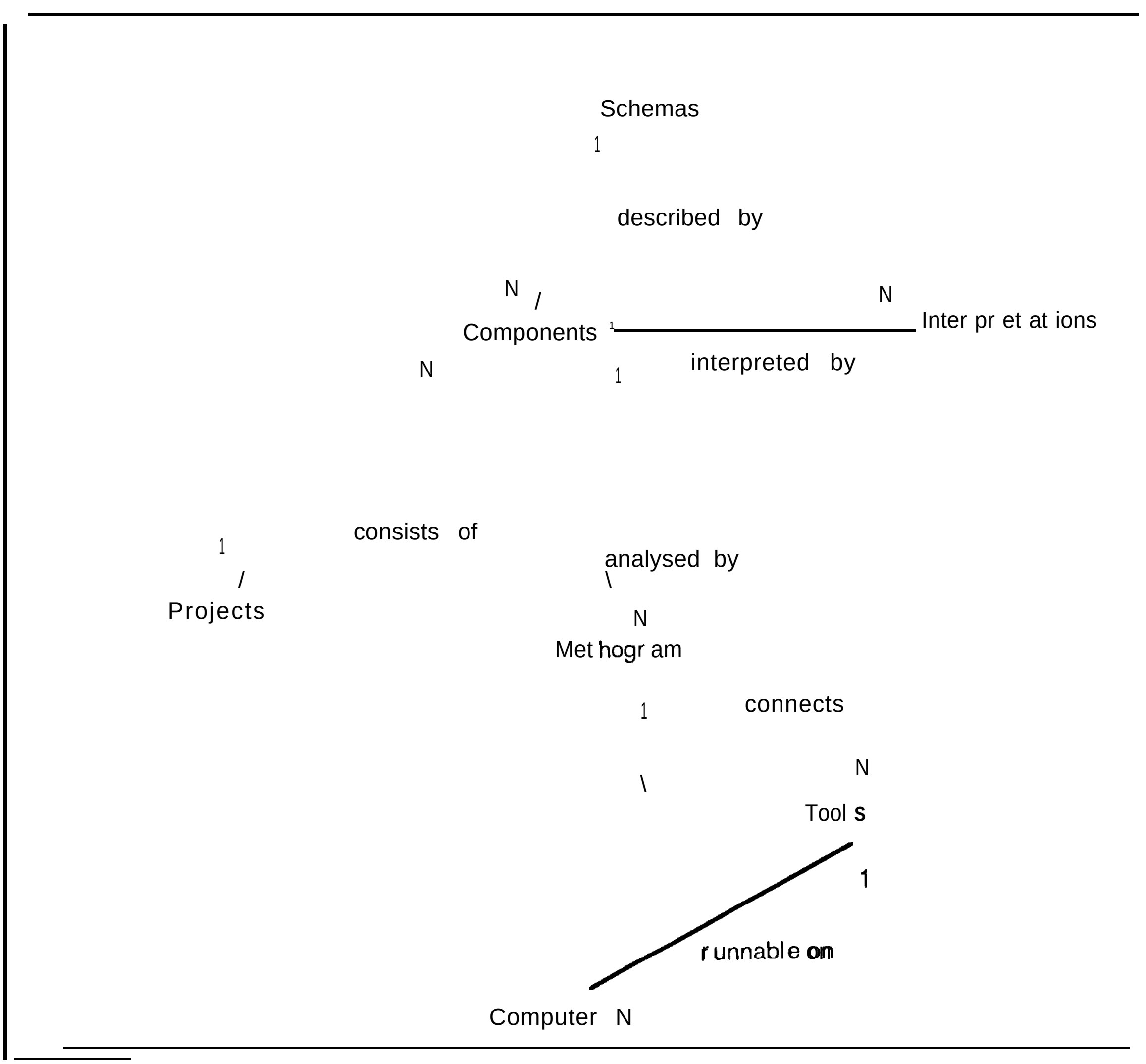

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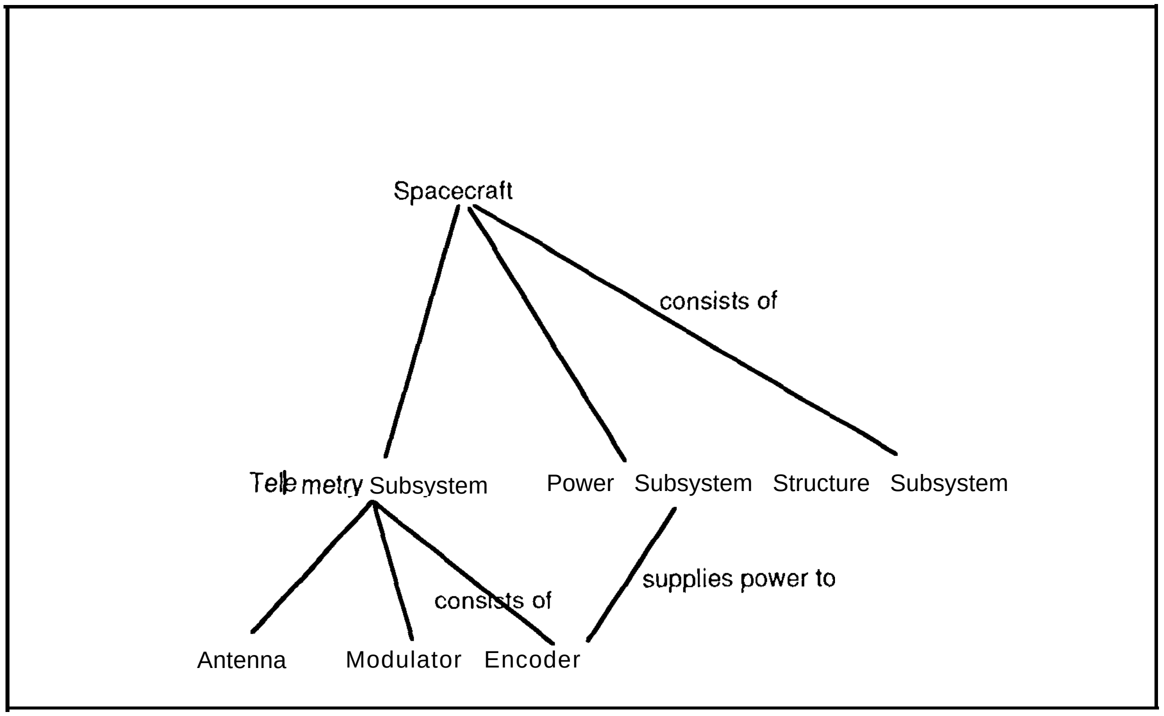

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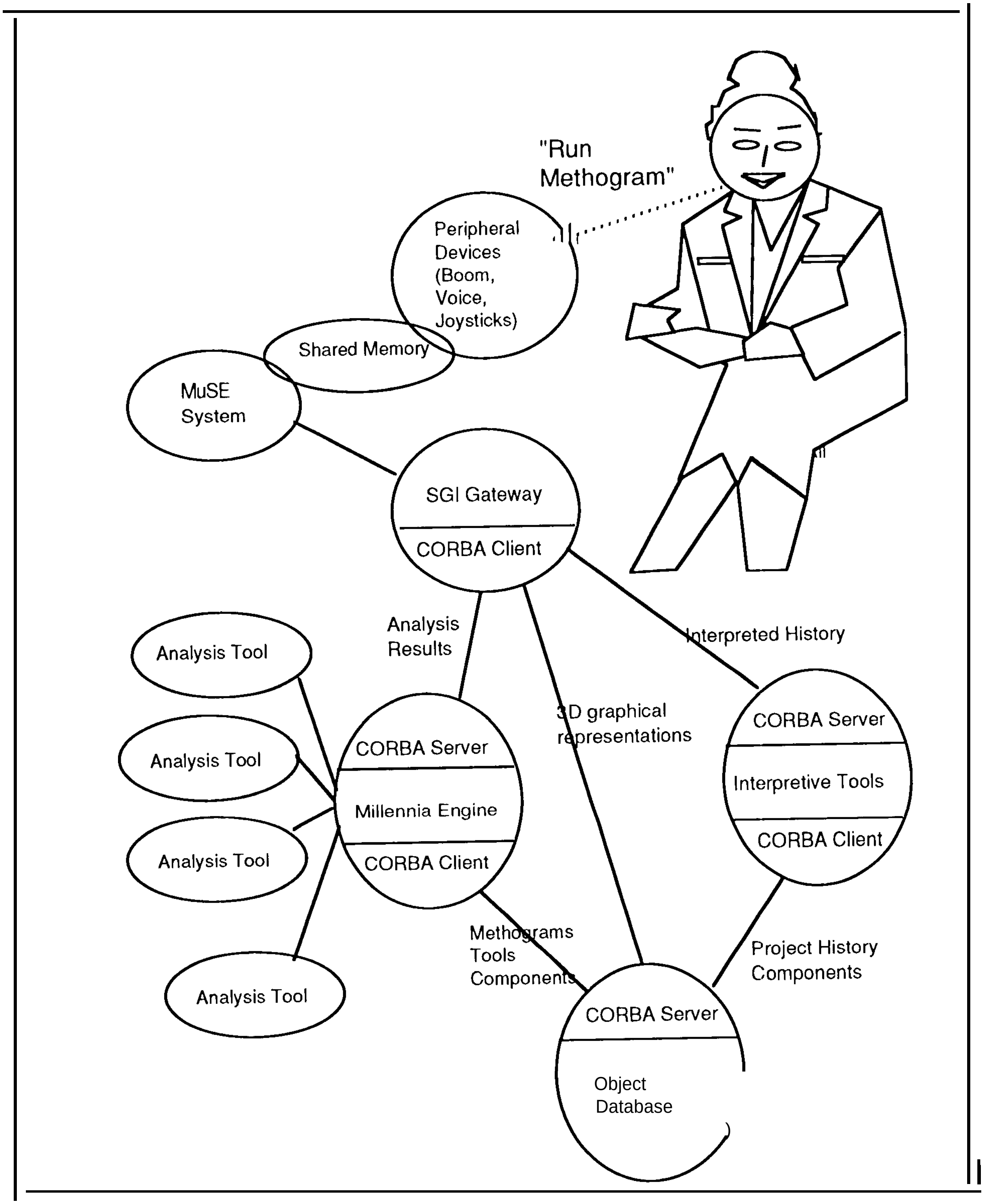

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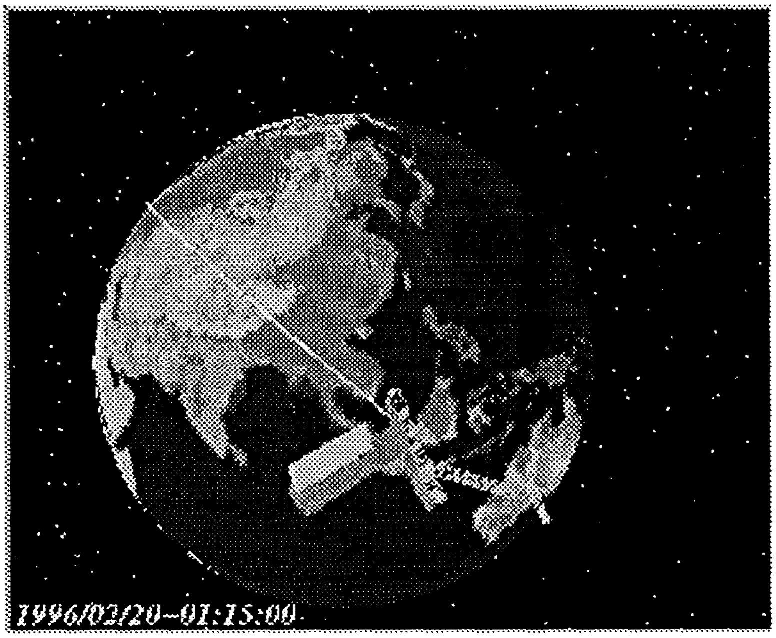

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